

THE UNIVERSITY OF TEXAS AT AUSTIN

Date: 9/1/2016

RECOMMENDATION FOR CHANGE IN ACADEMIC RANK/STATUS

Name: Foster, John T. EID: jf28456 Present Rank: Assistant ProfessorYears of Academic Service (*Include AY 2016-17 in each count*):At UT Austin since: 9/1/2014 (month/day/year) Total Years at UT Austin: 3In Present Rank since: 9/1/2014 (month/day/year) Total Years in Present Rank: 3*Tenure-track only:*Number of Years in Probationary Status: 3Additional information: AcceleratedPrimary Department: Petroleum and Geosystems EngineeringCollege/School: Engineering, Cockrell School ofJoint Department: N/ACollege/School: N/AOther Department(s): Aerospace Engineering and Engineering MechanicsRecommendation actions¹:By Budget Council/Executive Committee: PromoteVote² for promotion 9; Against 0; Abstain 0; Absent 0; Ineligible to vote 1By Department Chair: PromoteBy College/School Advisory Committee: Do Not PromoteVote² for promotion 1; Against 6; Abstain 0; Absent 0; Ineligible to vote 0By Dean: PromoteAdministrative Action: Promote to Associate ProfessorDate Action Effective: September 1, 2017

(To be submitted to the Board of Regents as part of the annual budget.)

By: Mauri McIn Date: December 15, 2016
For the President¹See "Chart of Recommended Actions" for eligible recommended actions applicable to specific conditions and administrative levels.²Record all votes for and against promotion, abstentions by eligible voting members, and the number of absent eligible voting members. The number of committee members ineligible to vote should also be recorded. Enter zero where it would otherwise be blank.

EXHIBIT

P's 148

Dean's Assessment**John T. Foster**

Department of Petroleum and Geosystems Engineering
Cockrell School of Engineering

Dr. John Foster received his BS and MS in Mechanical Engineering from Texas Tech University in 2002 and 2004, respectively, and his PhD in Aeronautics and Astronautics from Purdue University in 2009. Dr. Foster was a member of the technical staff at Sandia National Laboratories for seven years (2004-2011)¹. Dr. Foster also held an adjunct faculty position at the University of New Mexico for the 2010-11 academic year.

Dr. Foster was appointed as an assistant professor in the Department of Mechanical Engineering at the University of Texas at San Antonio (UTSA) in September 2011. In September 2014, he joined the faculty in the Department of Petroleum and Geosystems Engineering at the University of Texas at Austin (UT) as an assistant professor. In January 2015, he received a courtesy appointment in the Department of Aerospace Engineering and Engineering Mechanics (ASE/EM). He is also an affiliated faculty member in the Institute for Computational Engineering and Sciences (ICES).

If successfully promoted to associate professor in September 2017, he will have accumulated three years of probationary service at UT, and he will have served in rank as an assistant professor (at UTSA and UT) for a total of 6 years. While this case is considered to be an early promotion when considering Dr. Foster's time at UT only, his total time in rank is consistent with our normal timeline.

Fifteen external review letters were requested. Seven letters were received, seven requests were declined, and one person did not respond. Of the letters received, four reviewers were selected by the budget council, one was selected by the department chair, and two were recommended by Dr. Foster. Of the declinations, two reviewers were selected by the budget council, two reviewers were selected by the department chair, and three were recommended by Dr. Foster.

Five letter writers are faculty at US universities: Minnesota, Illinois, Penn State, Oklahoma, and Texas A&M. One letter writer is a distinguished member of the technical staff at Sandia National Laboratories, and one is a retired senior fellow from ConocoPhillips. Two of the letter writers are members of the National Academy of Engineering (NAE).

Teaching

Dr. Foster has taught two undergraduate courses at UT (PGE 334, *Reservoir Geomechanics*, and PGE 323M, *Reservoir Engineering III*) and one graduate course (PGE 379/383, *Advanced Geomechanics*). He has taught PGE 334 twice, with class sizes of 81 and 25 students, and instructor ratings of 3.4 and 4.3, respectively. Dr. Foster taught PGE 323M once, with a class size of 65 students and an instructor rating of 4.1. He taught PGE 379 twice, with class sizes of 13 and 14 students, and instructor ratings of 4.3 and 4.9, respectively.

¹ Dr. Foster participated in the University Part-Time Program while working at Sandia. He worked half-time throughout his PhD studies. He was in residence at Purdue during the 2007-08 academic year and returned to full-time status at Sandia after graduating in December 2009.

Average instructor ratings in PGE for assistant professors teaching undergraduate and graduate courses are 4.17 and 4.19, respectively. Corresponding averages in the Cockrell School of Engineering are 4.17 and 4.34, respectively. Excluding the first time he taught PGE 334, Dr. Foster's instructor ratings in the undergraduate courses are near the departmental average, and his scores for the graduate course are considerably above the departmental average.

A senior faculty conducted a peer review of Dr. Foster's class in April 2016. The evaluator concluded that Dr. Foster was a very good teacher and presented the technical information in a systematic manner that was easy for the students to understand.

Dr. Foster is an innovator in flipping the classroom. He began this approach with a course on high performance computing that he developed at UTSA, and has used this approach in all three of his courses at UT. He displays Powerpoint slides using a tablet computer and he writes directly on the tablet as he lectures. He captures his voice and the annotations in real time. After each class, Dr. Foster divides the recording into four or more segments, and posts the segments on Canvas and/or YouTube for the students to access. These recordings are also used by students outside of UT. For example, the YouTube tutorials that he developed for high performance computing have been viewed more than 230,000 times (corresponding to a total of 800,000 minutes of viewing time).

Research

Dr. Foster's research focuses on computational and experimental mechanics. His main contributions are in three areas: (1) high-strain rate material characterization and modeling, (2) fundamental contributions to the theories and computational methods related to peridynamics and nonlocal modeling, and (3) development of a new class of hydraulic fracture models. At UT, Dr. Foster has articulated a vision of coupling geomechanics into traditional reservoir simulations to efficiently and safely bring unconventional resources into production. This approach is challenging, because introducing geomechanics will greatly increase the complexity and computational expense of these simulations. Highlights of Dr. Foster's research include:

- Seven archival journal papers in rank at UT and 12 in rank at UTSA (career total of 22). Dr. Foster's post-docs are the first author on five of his seven papers in rank at UT. He wrote one paper at UT with his PhD student.
- Ten of his papers in rank at UT and UTSA appear in high-impact journals, including *Computer Methods in Applied Mechanics and Engineering* (IF=3.467), *Communications in Nonlinear Science and Numerical Simulation* (2.834), *Computational Mechanics* (2.639), *Journal of Computational Physics* (2.556), *Computational Material Science* (2.086), and *International Journal of Solids and Structures* (2.081).
- Dr. Foster is one of four editors of *The Handbook of Peridynamic Modeling*, which will be published by CRC Press in November 2016.
- An h-index of 9 (Google Scholar), with 275 citations.²

Dr. Foster has been very successful in securing research funding from external sources. He has been the sole PI on nine external grants and a co-PI on two. Total research funding in rank (at UT and UTSA) is \$10.3 million, with his share being \$2.4 million. It is important to note that he is a co-PI on a \$7.5-million Multidisciplinary University Research Initiatives (MURI) award from the Air

² While working at Sandia, much of Dr. Foster's research was sensitive in nature, and could not be published in the open literature. He did publish internal technical reports at Sandia, but those documents are, by definition, not considered in standard citation measures.

Force Office of Scientific Research related to predicting material failures using peridynamics modeling. The University of Arizona hosts this center, and the other universities are Nebraska, Columbia, and Arizona State.

Before moving to UT, Dr. Foster received a \$1.6-million award with Mukul Sharma (PGE) from the National Energy Technology Laboratory. He has also received research funding from Sandia, the Army Research Laboratory, the Army Research Office, and GE Global Research.

The external letters – and the internal letter from Tinsley Oden (ICES) – highlight the importance of Dr. Foster's research accomplishments, and uniformly support his promotion:

Emmanuel Detournay³ (Minnesota, NAE) writes, "It is clear, from the reading of these contributions [the five most significant papers] that Dr Foster has significantly contributed to the extension of the original peridynamics paradigm. ... After reading these papers, I very much appreciate the rigor of the approach, as well as the systematic effort of proving that the peridynamic formulation indeed degenerates gracefully to the appropriate classical (local) continuum model." Detournay concludes, "Dr Foster has developed a vibrant research program at Austin. I foresee a bright future for him, with continued excellent contributions to computational mechanics. He has my undeserved [sic] support for his promotion to the position of Associate Professor at the University of Texas at Austin."

Derek Elsworth⁴ (Penn State, NAE) states that had never met Dr. Foster, nor read his work before writing this letter of reference. He discusses Dr. Foster's future promise as, "This is probably the strongest portion of his dossier – working at a relatively sophisticated and advanced level in the general area of computational mechanics, and although some of his topical choices are no doubt dictated by his prior (pre-PGE) engagement and interests at Sandia and otherwise, his potential to complete high-quality and profession-leading research is high. His strong mechanics background makes this a straightforward transition – no doubt his ability to ask the important questions in his (new) discipline will evolve with his continuing engagement within his revised research trajectory." Elsworth concludes, "In summary, the candidate has already made significant contributions to the literature in his original area of study (computational mechanics in general with an emphasis on peridynamics and mesh-free methods) and is redefining his research direction in closer alignment with his current position and interests. His success in this is apparent in his awards (AFOSR), funding (which is significant) and in publication in important journals in his field. He is certainly deserving of tenure and promotion in a research-one institution – which I support without reservation."

Armando Duarte⁵ (Illinois) began his letter with comments about a recent presentation, "I recall very well his excellent plenary lecture at Eighth International Workshop Meshfree Methods for Partial Differential Equations held in Bonn, Germany, last fall. He presented his work on multi-physics models for hydraulic fracture simulation and also recent fundamental theoretical advancement of the peridynamic theory of porous media fracture. His peridynamic model was, to my knowledge, the first to simulate poroelasticity and fluid-driven fracture propagation. Applications of his method include the simulation of hydraulic fracturing of oil and gas reservoirs."

³ Endowed Chair, Department of Civil, Environmental and Geo-Engineering

⁴ Professor, Department of Energy and Mineral Engineering

⁵ Professor, Department of Civil and Environmental Engineering

Duarte notes that “Dr. Foster is very comparable in stature and development to the top young computational mechanics faculty at leading universities in the United States.” He goes on to compare Dr. Foster favorably to recently promoted faculty at Columbia University, Vanderbilt, and UIUC.

Ahmad Ghassemi⁶ (Oklahoma) writes that he does not know Dr. Foster, but he is “familiar with his work and his reputation in the computational aspects of hydraulic fracturing;” “familiar with his work on developments in peridynamics to model fracture propagation in porous media;” and “aware that a number of investigations have used his open-source codes.” Further, Ghassemi notes that, “Dr. Foster has established himself as a major player in peridynamics for hydraulic fracturing. He is clearly well recognized for his contributions to numerical methods and computational mechanics and is on track for further professional growth and leadership.”

Brad Boyce⁷, (Sandia National Laboratories) commented on Dr. Foster’s reputation within Sandia, “In spite of John’s brief tenure at Sandia, he had already established himself as ‘the’ internal expert on the application of peridynamics to problems in fracture. While Dr. Stewart Silling invented peridynamic theory at Sandia, it was clear that Stewart deferred to John with regard to how best to apply peridynamics to fracture of ductile metals. ... Moreover, I found John’s dual expertise with both computational and experimental methods to be a rare and powerful combination. He is simultaneously quite practical yet steeped in rigorous theory. When John left Sandia several years ago, he left a vacuum of expertise that has been difficult to replicate.” Boyce provides an interesting perspective on Dr. Foster’s technical capabilities, “What is particularly telling is that at least two of John’s major research projects come as a sub-investigator on a much larger effort: in those cases, top professors sought out John’s capability as a clear ‘rising star’. They risked engaging a new professor at a mid-tier university⁸ because they were convinced that John would make a substantial technical contribution.”

Lee Chin⁹ (ConocoPhillips) notes that “My expertise is in the areas of geomechanics, coupled geomechanics and reservoir simulation, development of computer models and numerical simulators, and numerical modeling. I don’t know Dr. John Foster. However, I have been following his technical publications over the past 4 years because of his innovative research work in using peridynamics. Thus, I am familiar with his research on applying peridynamics for solving challenging and important problems associated with solid/fracture mechanics and fluid flow.” Chin further states, “In the area of computational mechanics with applications to geomechanics and fracture mechanics, I believe Dr. Foster is one of the best scholars/researchers compared with others in his cohort at research-intensive universities such as Stanford University, Texas A&M University, Colorado School of Mines, University of Oklahoma, and University of Calgary.”

Peter Valko¹⁰ (Texas A&M) comments on the technical content of Dr. Foster’s papers, “It is a pleasure to read the various suggestions in Dr. Foster’s papers, for instance regarding how fracture propagation or Darcy’s law are handled in peridynamics. The publications show deep understanding of solid and fluid mechanics as well as abundant creativity.” Valko did note that only five of Dr. Foster’s publications had been cited 15 or more times, and commented, “This is a reasonable good result considering the author’s age but the numbers are somewhat smaller than I

⁶ Endowed Chair, School of Petroleum and Geological Engineering

⁷ Distinguished Member of the Technical Staff

⁸ Dr. Foster was an assistant professor at UTSA when both of the proposals described by Dr. Boyce were submitted.

⁹ Reservoir Engineer Fellow (retired)

¹⁰ Endowed Chair, Department of Petroleum Engineering

anticipated.” This observation does not appear to be a serious concern for Valko, as he has “no doubt that Dr. Foster would be promoted to the ranks of associate professor at any research intensive university.”

Tinsley Oden¹¹ also provided feedback to regarding Dr. Foster’s participation in ICES, “I have followed his research closely, heard him lecture on contemporary topics in computational mechanics, geomechanics, materials science, hydraulic fracture and crack propagation, peridynamics, and other subjects. ... I have talked with him at length about deep topics at the forefront of contemporary computational science and engineering. I am fully convinced that he is a truly exceptional academic, a top intellect and expert in his field, a strong and innovative researcher, a dedicated teacher, a trustworthy faculty colleague, and a true, loyal supporter of his department and our university.” Oden further notes, “Foster is a person of extraordinary breadth. He is able to work at a very high level in many different areas of engineering. His quite innovative work on modeling hydraulic fracture must stand among the most innovative and important in this area. It demonstrates that he has successfully turned his attention to important problems in petroleum engineering.”

As discussed in the introductory remarks, seven people (including two NAE members) declined requests to provide letters for Dr. Foster. Five of the potential reviewers cited a lack of expertise in Dr. Foster’s primary area of research and/or other commitments. Two potential reviewers questioned if Dr. Foster belonged in a department of petroleum engineering.

- Stephen Holditch¹² (Texas A&M, NAE) notes, “I know nothing about his specialty and I am not impressed with his publications for most of his career as I do not see how they fit well in Petroleum Engineering.”
- Mohamed Soliman¹³ (Univ. of Houston) writes that Dr. Foster “is obviously a smart person with excellent publications, however, most of them do not even belong to Petroleum Engineering field.”

Advising and Student Mentoring

Dr. Foster graduated one PhD student from UTSA in 2014. The student moved to UT with Dr. Foster and served as a post-doc before moving to the Army Research Laboratory. One post-doc at UTSA also moved to UT with Dr. Foster.

Dr. Foster is currently supervising seven PhD students (two are co-supervised). Three of these students have passed their qualifying exams, but none has graduated. Dr. Foster graduated five MS students at UTSA, and is currently supervising two at UT.

University Service

Dr. Foster serves on several departmental committees (undergraduate studies, graduate admissions, and department awards) and the Cockrell School honors committee.

¹¹ Endowed Chair and Director, Institute for Computational Engineering and Sciences

¹² Endowed Chair and Head, Department of Petroleum Engineering

¹³ Endowed Chair and Department Chair, Department of Petroleum Engineering

Professional Service

Dr. Foster is very active in several professional organizations. He helped organize three workshops sponsored by the US Association for Computational Mechanics. He also helped organized eight different symposia, mostly associated with the Computational Mechanics Committee within the American Society of Mechanical Engineers.

Other Evidence of Merit or Recognition

Dr. Foster received an Air Force Young Investigator Award in 2013. To recognize his outstanding and innovative contributions to teaching, he received the Petroleum Engineering Innovative Teaching Award from the Society of Petroleum Engineers in 2015.

Overall Assessment

Dr. Foster is a strong teacher and an innovative researcher. He has successfully secured significant research funding, both as a sole PI and as part of multi-institutional research grants. He is currently supervising a large research group. His publication record over the past five years is strong, but his total number of citations is adversely affected by his limited ability to publish in the open literature while employed at Sandia National Laboratories.

The members of the Promotion and Tenure Committee do not believe that Dr. Foster meets expectations for promotion to associate professor with tenure. They have three primary concerns:

1. Dr. Foster published three papers in journals with modest impact factors since he joined UT.
2. He has not graduated a PhD student from UT. Although one of his PhD students graduated from UTSA, they are concerned that the standards are not the same at the two schools.
3. They were concerned by the large number of potential referees who declined to write letters for Dr. Foster, and in particular, the comments provided by Holditch and Soliman.

Each of these issues is discussed below.

Dr. Foster did publish three papers during the past two years in the journals with modest impact factors: *Physica E: Low-dimensional Systems and Nanostructures* (1.904), *Physica A: Statistical Mechanics and its Applications* (1.785), and *ASME Journal of Applied Mechanics* (1.357). However, during that same period, he published four papers in journals with much higher impact factors. There are many reasons why an assistant professor may choose to publish in a particular journal, and I am not particularly concerned. He has selected a wide variety of journals to publish his work, and I am hopeful that with a little mentoring, he will focus on the more prominent journals in the future.

Dr. Foster has been in residence at UT for two years. Unless a very senior graduate student moved to UT with him, it would not be possible for him to graduate a PhD student in this time period. While at UTSA, Dr. Foster did work with graduate students and post-docs at UT (joint project with Mukul Sharma) and at Northwestern (as a result of the MURI competition, Wing-Kam Liu and Ted Belytschko reached out to collaborate with Dr. Foster). There is every indication that Dr. Foster is an outstanding mentor, and I do not believe that Dr. Foster's promotion should be delayed for several years while he waits for a PhD student to graduate from UT.

Finally, Holditch and Soliman expressed opinions in email correspondence after a cursory review of Dr. Foster's CV. I do not believe that these opinions should be given the same weight as those of the external reviewers who provided detailed assessments. These opinions are also in direct conflict with those of several the reviewers who found very close ties between Dr. Foster's work and

important topics facing petroleum engineers today and in the future. As noted by Jon Olson, PGE department chair, one of the strengths of the Department of Petroleum and Geosystems Engineering at UT is that many of the faculty did not earn their degrees in petroleum engineering. By recruiting faculty with interests in petroleum engineering, but backgrounds in other areas, the department has a long history of developing unique solutions to the problems facing the oil and gas industry. The department has been extremely successful using this strategy for hiring faculty, and I believe that Dr. Foster will continue this tradition.

In conclusion, I strongly disagree with the members of the Promotion and Tenure Committee. Dr. Foster is a rising star in the areas of experimental and computational mechanics, and I believe that he meets or exceeds expectations for promotion to associate professor with tenure in all areas. I support his case without reservation.

A handwritten signature in black ink, appearing to read "Sharon L. Wood". The signature is written in a cursive, flowing style.

Sharon L. Wood, Dean
21 October 2016

**Statistical Summary for “In Rank”
John T. Foster, Ph.D., P.E.**

Metric	Value
Peer-reviewed journal publications (in rank <i>and total</i>)	19 / 22
Peer-reviewed conference proceedings (in rank <i>and total</i>)	5 / 14
Number of <i>journal</i> papers <i>in rank</i> with UT (UTSA) students <i>as co-authors</i>	3 (4)
Total citations of all publications (career) <i>from ISI Web of Knowledge</i>	124
h-index (career) <i>from ISI Web of Knowledge*</i>	7
Total citations of all publications (career) <i>from Google Scholar</i>	261
h-index (career) <i>from Google Scholar</i>	9
Total external research funding raised	\$10.29M
Total external research funding raised (candidate's share)	\$2.4M
Total number of external grants/contracts <i>awarded</i>	11
Number of external grants/contracts <i>awarded</i> as PI	9
PhD students completed†	1 (1)
MS students completed†	5 (5)
PhD students in pipeline (as of 09/2016) †	6 (5)
MS students in pipeline (as of 09/2016) †	2 (2)
Number of courses taught	6
Total # of students taught in organized courses	363
Average instructor evaluation for UG courses	3.9
Average instructor evaluation for Grad courses	4.5
Average course evaluation for UG courses	3.8
Average course evaluation for Grad courses	4.3
Teaching awards	1
Student organizations advised	3
Undergraduate <i>researchers</i> supervised	5
Service on journal editorial boards	0
Number of symposia organized	10

****Provide a printout/screen shot of the first page of the report from both ISI Web of Knowledge and Google Scholar***

† Count a student as 1.0 if sole supervisor and 0.5 if co-supervised.